Information and Technology for Better Decision Making

2012 Service Academy Gender Relations Survey

Statistical Methodology Report

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2012 SERVICE ACADEMY GENDER RELATIONS SURVEY:

STATISTICAL METHODOLOGY REPORT

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Executive Summary

The *2012 Service Academy Gender Relations Survey* (*2012 SAGR*) is designed to track sexual assault and sexual harassment issues at the Service Academies. U.S. Code 10, as amended by Section 532 of the John Warner National Defense Authorization Act for Fiscal Year 2007, codified an assessment cycle at the Academies that consists of alternating surveys and focus groups. This requirement applies to the U.S. Military Academy (USMA), U.S. Naval Academy (USNA), and U.S. Air Force Academy (USAFA). Previous assessments in this series were survey based, with the first conducted in 2004 by the Department of Defense (DoD) Inspector General (IG). Responsibility for subsequent assessments was transferred to the Defense Manpower Data Center (DMDC) which conducted surveys in 2005, 2006, 2008 and 2010; focus groups were conducted in 2007, 2009, 2011, and 2013 by DMDC.

The U.S. Coast Guard Academy (USCGA), the only Federal Military Academy within the Department of Homeland Security (DHS), is not required to participate in the assessments codified by U.S. Code 10. However, USCGA officials requested that they be included, beginning in 2008, in order to evaluate and improve their programs addressing sexual assault and sexual harassment. USCGA was surveyed under the authority of U.S. Code 14 Section 1.

This report describes the sampling and weighting methodologies used in the *2012 SAGR* survey. Calculation of response rates is described in the final section.

The population of interest for the *2012 SAGR* consisted of the cadets or midshipmen from the class years 2012 through 2015 at the Service Academies. The Service Academies include USMA, USNA, USAFA, and USCGA.

The survey administration period lasted from March 19 to May 5, 2012. A sample of 2,821 female and 4,438 male students was selected from the population of all students. Usable questionnaires were returned by 5,425 students: 2,271 female and 3,154 male students.

The *2012 SAGR* used a single stage stratified sample design for the males at USMA, USNA, and USAFA. The allocation was nonproportional based on response rates from previous SAGR surveys. The total sample size was based on precision requirements for key reporting domains such as sexual harassment and unwanted sexual contact. Due to the small number of females in all Academies and the relatively small number of males in the USCGA, a census was taken of all eligible female Service Academy students and all eligible USCGA students to assure more reliable results.

Analytic weights were created to account for unequal selection probabilities and varying response rates among population subgroups. First, sample records were classified for weighting according to eligibility for the survey and completion of the return. Second, the sampling weights (the inverse of the selection probabilities) were adjusted to account for sample members whose eligibility could not be determined. Third, the eligibility-adjusted weights were adjusted

to account for eligible sample members who returned usable questionnaires that could not be placed in a sampling stratum.

Location, completion, and response rates are provided in the final section of this report for both the full sample and for population subgroups. These rates were computed according to the RR3 recommendations of the American Association of Public Opinion Researchers (AAPOR) (2008). The location, completion, and response rates were 96%, 78%, and 75%.

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Statistical Methodology Report

This report describes sampling and weighting methodologies for the *2012 Service Academy Gender Relations Survey* (*2012 SAGR*) . The first section describes the design and selection of the sample. The second section describes weighting and variance estimation. The final section describes the calculation of response rates, location rates, and completion rates for the full sample and for population subgroups. The design of this survey is based on the *2010 SAGR* survey responses as outlined in the *Service Academy 2010 Gender Relations Survey*: *Tabulation of Responses* (DMDC, 2010). Information about administration of the survey and detailed documentation of the survey datasets is found in the *2012 Service Academy Gender Relations Survey: Tabulations of Responses* (DMDC, 2012).

Sample Design and Selection

Target Population

The *2012 SAGR* was designed to represent all students[1] at the following Service Academies:

- U.S. Military Academy (USMA)
- U.S. Naval Academy (USNA)
- U.S. Air Force Academy (USAFA)
- U.S. Coast Guard Academy (USCGA)

Fielding of the survey began on March 19, 2012 and ended on April 23, 2012**.**

Sampling Frame

The sampling frame consisted of 14,120 records drawn from the student rosters provided to DMDC by each Academy. The final drawn sample was 7,259. Follow-up information used to develop the frame was obtained from the Academies prior to the scheduled starting date of the survey field period. Sample members who subsequently became ineligible were either foreign nationals, exchange students from other Academies, or students who left the Academy. The final eligible sample was 7,258 students.

Sample Design

The *2012 SAGR* used a single-stage stratified design for the males at USMA, USNA, and USAFA. Three population characteristics defined the stratification dimensions: Service Academy, Gender, and Class Year. These characteristics are displayed with an asterisk (*) under

[1] The target population excludes foreign nationals, exchange students from another Academy, and students who left the Academies.

the variable column in Table 1. The frame was partitioned into 32 strata. The frame is a combination of the stratification dimensions: four categories for Service Academies, two categories for gender, and four categories for class year. The combination of all the categories (4 x 2 x 4) created the 32 strata.

All students at USCGA and female students at the other three Academies were selected with certainty. Males at USMA, USNA, and USAFA were randomly selected and without replacement. Because allocation of the sample was not proportional to the size of the strata, selection probabilities varied among strata, and individuals were not selected with equal probability overall. Nonproportional allocation was used to achieve adequate sample sizes for small subgroups of analytic interest, known as reporting domains. These domains included subgroups defined by the stratification characteristics, as well as other key reporting domains. Key reporting domain variables are shown in Table 1.

Table 1.
Variables for Stratification and Key Reporting Domains

Variable	Categories
Service Academy*	USMA USNA USAFA USCGA
Gender*	Male Female
Class Year*	Class of 2012 Class of 2013 Class of 2014 Class of 2015
Experienced Sexual Assault	Yes No
Experienced Sexual Harassment	Yes No

* Stratification variable

Sample Allocation

The total sample size (7,259) was based on precision requirements for key reporting domains as well as a census of female Service Academy students and all USCGA students. Given estimated variable survey costs and anticipated eligibility and response rates, an optimization algorithm determined the minimum-cost allocation that simultaneously satisfied the domain precision requirements.

The allocation was accomplished by first obtaining a complete list of all students enrolled at USMA, USNA, and USAFA. The names of each student as well as other identifying information (not used in this survey, except for gender) were in a list in an Excel spreadsheet.

Separate datasets were created for each Service Academy and the names were grouped within the Academies by class year and gender. Since a census of all females attending any Service Academy was required for this survey, all females were automatically included in the sample as well as a census of all male USCGA students to produce reliable results; a random number seed for all non-USCGA male students was provided by SAS© and each record was assigned a random number. The allocation for all non-USCGA males was created by entering the population count, eligibility, and prevalence into the following equation.

$$n = \frac{Nz^2(p(1-p) + p^2(1-P))/P}{e^2(N-1) + Z^2(p(1-p) + p^2(1-P))/P}$$

where e = Anticipated Precision set to 0.05, n = Stratum Sample Size, N = Stratum Population Size, Z = 1.96 (2 Standard Deviations), p = Prevalence Rate, and P= Eligibility Rate.

The target number of students from a particular Academy and class was then used together with the random number assigned to each student record to determine which male students were selected to participate in the survey from each non-USCGA. The number of students is shown in Table 2. Sample sizes are shown in Table 3 for the levels of the stratification dimensions.

Table 2.
Population Size by Service Academy, Gender, and Class Year

Stratification Variable	Total	USMA	USNA	USAFA	USCGA
Total	14,120	4,446	4,440	4,232	1,002
Gender					
Male	11,299	3,743	3,566	3,295	695
Female	2,821	703	874	937	307
Graduating Class					
Class of 2012	3,460	1,029	1,106	1,083	242
Class of 2013	3,362	1,033	1,041	1,044	244
Class of 2014	3,643	1,185	1,128	1,079	251
Class of 2015	3,655	1,199	1,165	1,026	265

Table 3.
Sample Size by Service Academy, Gender, and Class Year

Stratification Variable	Total	USMA	USNA	USAFA	USCGA
Total	7,259	1,865	2,182	2,210	1,002
Gender					
Male	4,438	1,162	1,308	1,273	695
Female	2,821	703	874	937	307
Graduating Class					
Class of 2012	1,825	444	566	573	242
Class of 2013	1,771	432	542	553	244
Class of 2014	1,844	499	539	555	251
Class of 2015	1,819	490	535	529	265

Weighting

Analytical weights for the *2012 SAGR* were created to account for unequal probabilities of selection and varying response rates among population subgroups. Sampling weights were computed as the inverse of the selection probabilities and then adjusted for nonresponse. The adjusted weights were poststratified to match population totals and to reduce bias unaccounted for by the previous weighting steps.

Case Dispositions

First, case dispositions were assigned for weighting based on eligibility for the survey and completion of the return. Execution of the weighting process and computation of response rates both depend on this classification.

Final case dispositions for weighting were determined using information from the completed *2012 SAGR* and depended on the number of students who participated in the survey. Whether the student had chosen to complete the survey or return the survey blank also influenced the weights. No single source of information is both complete and correct; inconsistencies among these sources were resolved according to the order of precedence shown in Table 4. Final case dispositions for the *2012 SAGR* are shown in Table 5.

Table 4.
Case Disposition Resolution

Case Disposition	Information Source	Conditions
Eligible, complete response	Item response rate	Survey returned with critical items completed and at least 50% of items completed
Ineligible, incomplete response	Item response rate	Survey returned with critical items not completed or at least 50% of items not completed
Not Returned	Missing	No survey was turned in, unable to participate
Ineligible	Service academy roster	Ineligible – exchange students from other academies, foreign nationals, and students who left the Academy

Table 5.
Sample Size by Case Disposition Categories

Case Disposition Category	Sample Size
Total	7,259
Eligible, Complete Response	5,425
Unusable/Incomplete Responses	1,532
Not returned	301
Ineligible during survey fielding	1

Assignment for Unknown Graduation Class Year

The third question asks for the respondent to report their class year.

3. What is your Class year?

- ☒ 2012
- ☒ 2013
- ☒ 2014
- ☒ 2015

The class year was a stratification variable. Since the survey is administered anonymously, if a respondent did not provide a class year, then there was an assignment for the unknown class year to properly assign the weights. The assignment of unknown class year was based on the weighted response rates from the respondents with known class year by Academy, gender, and class year. The response rates are shown in Table 11. Table 6 shows the number of unknown class years by Service Academy, Gender, and Class Year.

Table 6.
Assignment of Unknown Class Year by Service Academy, Gender, and Class Year

Gender / Class Year	Total	USMA	USNA	USAFA	USCGA
Total	57	18	18	10	11
Male	39	13	10	8	8
2012	12	4	4	2	2
2013	12	4	4	2	2
2014	10	4	2	2	2
2015	5	1	0	2	2
Female	18	5	8	2	3
2012	2	1	0	0	1
2013	3	0	1	1	1
2014	6	1	3	1	1
2015	7	3	4	0	0

Eligible Completed Cases for Weighting

After the assignment for the unknown class year, the completed eligible cases for weighting were calculated by adding the number of completed eligible cases with known class year with the number of completed eligible cases with unknown class year. The total number of eligible cases for weighting is shown in Table 7.

Table 7.
Completed Eligible Cases for Weighting by Service Academy, Gender, and Class Year

Gender / Class Year	Total	USMA	USNA	USAFA	USCGA
Total	5,425	1,513	1,574	1,537	801
Male	3,154	897	876	850	531
2012	817	228	233	231	125
2013	763	217	207	221	118
2014	759	219	213	187	140
2015	815	233	223	211	148
Female	2,271	616	698	687	270
2012	508	121	166	164	57
2013	468	113	142	156	57
2014	644	194	193	184	73
2015	651	188	197	183	83

Nonresponse Adjustments and Poststratification

After case dispositions were resolved, the population and sample counts were adjusted for ineligible cases. Ineligible cases were students who were in the process of separation at the execution of the survey or students who decided to withdraw their answers to the survey after submission. One student withdrew his/her answers to the survey and was declared ineligible. Then sampling weights were adjusted due to nonresponse. First, the sampling weights for cases of known eligibility were adjusted to account for cases of unknown eligibility. Next, the response rate for the *2012 SAGR* was calculated by taking the ratio of the number of eligible, completed surveys and the unknown eligibility weighted sample value. The sample weight was then calculated by taking the ratio of the unknown eligibility weighted population value and the unknown eligibility weighted sample value. The probability of an eligible survey was then calculated by taking the ratio of the eligible sample and the unknown eligibility weighted sample. The probability of an eligible survey was then adjusted by taking the ratio of the total population and the probability of an eligible survey that was just calculated. Then, the probability of a complete *2012 SAGR* was calculated by taking the ratio of the number of actual completed surveys and the number of surveys that were returned. This value was then adjusted by taking the ratio of the entire population and the probability that was just calculated. The weights for the probability of completion were then calculated by multiplying the sample weight of eligibility with the adjusted completion probability.

Finally, the weights were poststratified to match population totals and to reduce bias unaccounted for by the previous weighting adjustments. The poststratified adjusted value for all service academies, genders, and class years was set to 1. The final weight was then calculated by multiplying the weight of completed surveys with the post-stratified adjusted value. The final weight for the eligible respondent represents the number of students at the Academy with the same gender and class year. For example, a male respondent graduating in 2012 at the USMA represents 3.851 male students in the 2012 USMA class year. The final weights by Academy, gender, and class year are shown in Table 8.

Table 8.
Final Weights by Service Academy, Gender, and Class Year

Gender / Class Year	USMA	USNA	USAFA	USCGA
Male				
2012	3.851	3.785	3.658	1.376
2013	4.120	4.038	3.756	1.466
2014	4.438	4.221	4.406	1.236
2015	4.288	4.242	3.773	1.196
Female				
2012	1.248	1.349	1.451	1.228
2013	1.230	1.423	1.372	1.246
2014	1.098	1.187	1.386	1.068
2015	1.064	1.112	1.257	1.060

Response Rates

Location, completion, and response rates were calculated in accordance with guidelines established by the Council of American Survey Research Organizations (CASRO). The procedure is based on recommendations for Sample Type II response rates (CASRO, 1982). This definition corresponds to The American Association for Public Opinion Research (AAPOR) RR3 (AAPOR, 2008), which estimates the proportion of eligible cases among cases of unknown eligibility.

Location, completion, and response rates were computed for the *2012 SAGR* as follows:

The location rate (LR) is defined as

$$LR = \frac{\text{adjusted located sample}}{\text{adjusted eligible sample}} = \frac{N_L}{N_E}.$$

The completion rate (CR) is defined as

$$CR = \frac{\text{usable responses}}{\text{adjusted located sample}} = \frac{N_R}{N_L}.$$

The response rate (RR) is defined as

$$RR = \frac{\text{usable responses}}{\text{adjusted eligible sample}} = \frac{N_R}{N_E}.$$

where

- N_L = Adjusted located sample
- N_E = Adjusted eligible sample
- NR = Usable responses.

The final response rate is the product of the location rate and the completion rate. The calculation and observed rates are shown in Table 9. Table 10 shows the sample counts broken down by the case disposition categories relative to the final drawn sample. Due to the one ineligible case, the rates relative to the final drawn sample in Table 10 would be slightly less than the observed rates in Table 9. The counts in Table 9 and Table 10 include the cases with unknown class year. The weighted response rates by Academy, gender, and class year are presented in Table 11. The weighted response rates exclude the cases of unknown class year. Since the assignment of class year for the cases of unknown class year are based on the weighted response rates, the overall weighted response rates would not change significantly.

Table 9.
Location, Completion, and Response Rates

Type of Rate	Computation	Calculation	Observed Rates
Location	Adjusted located sample / Adjusted eligible sample	6957 / 7258	95.9%
Completion	Usable responses / Adjusted located sample	5425 / 6957	78.0%
Response	Usable responses / Adjusted eligible sample	5425 / 7258	74.7%

Table 10.
Comparison of the Final Sample Relative to the Drawn Sample

Case Disposition Categories	Sample Counts	
	Total	**%**
Drawn sample & Population	7,259	100%
Total: Ineligible	1	
Ineligible during survey fielding	1	
Eligible sample	7,258	100%
Unable to participate	301	
Located sample	6,957	95.8%
Total: Nonresponse	1532	
Returned blank	652	
Did not complete 50% of survey items	1,114	
Skipped key questions	1,497	
Usable responses	5,425	74.7%

[1] The denominator for the percentages is based on the final drawn sample size which is 7,259.
[2] The nonresponse categories are not mutually exclusive or independent. For example, if a student returned a blank survey, then they did not answer the critical questions and did not complete 50% of the survey items.

Table 11.
Weighted Response Rates by Service Academy, Gender, and Class Year

Gender / Class Year	Total	USMA	USNA	USAFA	USCGA
Total	0.73	0.79	0.70	0.68	0.80
Male	0.71	0.77	0.67	0.67	0.76
2012	0.72	0.78	0.68	0.69	0.73
2013	0.67	0.74	0.61	0.65	0.68
2014	0.71	0.77	0.69	0.62	0.81
2015	0.75	0.80	0.71	0.71	0.84
Female	0.81	0.88	0.80	0.73	0.88
2012	0.74	0.80	0.74	0.69	0.81
2013	0.75	0.81	0.70	0.73	0.80
2014	0.83	0.91	0.84	0.72	0.94
2015	0.88	0.94	0.90	0.80	0.94

[1] Response rates do not include the cases with unknown class year.

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